

PATENT SPECIFICATION

DRAWINGS ATTACHED

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COMPLETE SPECIFICATION

Improvements in or relating to Quick Release Fasteners

We, AERPAT AKTIEN GESELLSCHAFT, of 3, Spielhof, Glarus, Switzerland, a Swiss Corporation, do hereby declare the invention, for which we pray that a patent may be granted to us, and the method by which it is to be performed, to be particularly described in and by the following statement:—

This invention relates to a quick release fastener of the kind comprising a body and a pin effective to move a locking element into a position in which it projects laterally from the body.

It is an object of the invention to provide a quick release fastener in which the release mechanism is actuated by fluid under pressure from an external source.

In accordance with the invention a quick release fastener comprises a body having a pressure chamber and a longitudinal passage communicating with the chamber: a locking element carried in the body and movable inwardly and outwardly between inner retracted and outer extended positions, the locking element projecting laterally from the body when in the outer extended position: a pin movable in the passage between locked and unlocked positions and including a piston disposed in the chamber, the pin having means thereon for moving the locking element outwardly into its extended position when the pin is in the locked position: spring means engaging the body and the pin and urging the pin towards the locked position: and means for introducing a fluid under pressure into the chamber for exerting a force on the piston opposing the spring means and moving the pin to the unlocked position.

Preferably, a further spring means is provided, the further spring means being mounted on the body with one end fixed thereto and having a free end movable toward and away from the locking element for clamping a member between the locking element and the

free end. Both spring means are advantageously formed as coil springs.

The fastener may include a plunger carried in the body and movable co-axially with the pin, the plunger projecting into the chamber for engaging the piston and projecting externally of the body for manual actuation to exert a force on the piston to move the pin to the unlocked position.

The invention also provides a quick release fastening system comprising a plurality of the fasteners and a conduit interconnecting the chambers of the fasteners whereby the pins of the fasteners may be simultaneously moved to the unlocked position.

A preferred form of the invention will now be described with reference to the accompanying diagrammatic drawings, in which:

Fig. 1 is a plan view of the fastening system of the invention showing a plurality of fasteners in position;

Fig. 2 is an enlarged sectional view taken along the line 2—2 of Fig. 1 showing one of the fasteners in detail;

Fig. 3 is a view similar to that of Fig. 2 showing the fastener in the partially released condition;

Fig. 4 is a partial view of the fastener of Fig. 2 showing the fastener in the disengaged condition;

Fig. 5 is a sectional view taken along the line 5—5 of Fig. 2; and

Fig. 6 is a sectional view taken along the line 6—6 of Fig. 2.

In the embodiment of the invention illustrated herein, a plurality of fasteners 10, 11, 12, 13 are being used to affix a plate 14 to another plate 15. Each fastener includes a body 16 having a pin 17 slidable therein in a longitudinal passage 18. The body 16 is dimensioned to be a sliding fit in aligned openings in the plates 14, 15 being joined and carries a locking element at the end 21

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which is positioned in the aligned openings. In the preferred form of locking element shown herein, a plurality of balls 22 are positioned in corresponding lateral openings 23, the balls being movable inwardly and outwardly between an outer extended position as seen in Fig. 2 and an inner retracted position as seen in Fig. 3. The outer ends of the openings 23 are slightly closed, as by peening, to retain the balls in the body.

The passage 18 in the body 16 communicates with a pressure chamber 26 in the body, the chamber being closed by a plug 27 which may be pressed into the open end of the chamber and held in place by spinning or otherwise turning over a shoulder 28. An O-ring seal 29 may be positioned in a groove in the plug for sealing engagement with the body. The pin is movable in the body between a locked position, as seen in Fig. 2, and an unlocked position, as seen in Fig. 3. The pin has a peripheral section 32 of larger diameter for engaging the balls 22 when in the locked position and forcing them to their outer extended positions. An annular groove 33 of lesser diameter is positioned adjacent the section 32 for permitting the balls 22 to move to the inner retracted position when the pin is in the unlocked position. A piston 34 is carried at the other end of the pin 17 for sliding movement in the chamber 26, an O-ring seal 35 on the piston providing sealing engagement with the inner wall of the chamber.

A compression coil spring 36 is positioned in the body around the pin and urges the pin to the locked position as shown in Fig. 2. Another compression coil spring 37 is positioned around the body, this spring serving as an ejection spring. One end of the spring 37 is fixed to the body, the fixed end being received in a groove 38 and being retained therein by deformation of the lip of the groove. A bearing plate 41 may be carried at the free end of the spring 37 with the spring terminating in a groove 42 in the plate and the outer edge of the groove being deformed to retain the spring therein as shown in Fig. 4.

A length of tubing 43 is fixed in the body 16 to provide fluid communication with the right end of the chamber 26 as seen in Figs. 2 and 3. Means also may be mounted on the body for engaging the piston to exert a force on the piston opposing the spring 36 to move the pin to the unlocked position. A preferred form of such means is shown herein consisting of a plunger 44 slidably positioned in the plug 27 and having an enlarged head 45 thereon for limiting outward movement of the plunger. An O-ring seal 46 may be placed in a groove in the plunger for sealing engagement with the plug so as to maintain the chamber pressure tight.

The fastener is shown in the disengaged

condition in Fig. 4 with the pin 17 in the locked position moving the balls 22 into their extended positions.

In order to insert the body into the openings of the plates to be joined, the pin is moved to the unlocked position by passing a fluid under pressure into the chamber 26 through the tubing 43 or by applying a manual force on the plunger 44. Moving of the pin to the unlocked position permits the balls 22 to move to their inner position as seen in Fig. 3. The body of the fastener is forced into the aligned openings, so compressing the ejection spring 37. When the fastener is inserted to the position shown in Fig. 2 and the pressure, either manual or fluid, is removed from the piston, the spring 36 will move the pin to the locked position and move the balls 22 outward, clamping the plates 14, 15 between the balls 22 and the bearing plate 41. The clamping force exerted by the fastener will be a function of the strength and compression of the spring 37 and can be constructed to have any desired value.

When the plates being fixed together are relatively large, a plurality of such fasteners may be used to provide the desired clamping force over the desired area. Four such fasteners are shown in Fig. 1. The tubes 43 of the fasteners are interconnected by a conduit 50 which may be a flexible hose or the like. The conduit is connected to a fluid pressure source (not shown) through a valve 51. This fastening system permits disengaging all of the fasteners automatically and simultaneously to provide instantaneous release of the plate 14 from the plate 15. Actuation of the valve 51 to introduce fluid under pressure into the conduit 50 produces a pressure build-up in the chamber of each of the fasteners, moving the respective pins to the unlocked positions and permitting the compressed springs 37 to eject the fasteners from the openings in the plates. Typical fluids for use with the fastener are compressed air, hydraulic brake fluid and hydraulic servo oil.

WHAT WE CLAIM IS:—

1. A quick release fastener comprising a body having a pressure chamber and a longitudinal passage communicating with the chamber: a locking element carried in the body and movable inwardly and outwardly between inner retracted and outer extended positions, the locking element projecting laterally from the body when in the outer extended position: a pin movable in the passage between locked and unlocked positions and including a piston disposed in the chamber, the pin having means thereon for moving the locking element outwardly into its extended position when the pin is in the locked position: spring means engaging the body and the pin and urging the pin towards the locked position: and means for introducing

a fluid under pressure into the chamber for exerting a force on the piston opposing the spring means and moving the pin to the unlocked position.

- 5 2. A quick release fastener as set forth in claim 1, including a further spring means, the further spring means being mounted on the body with one end fixed thereto and having a free end movable towards and away from the locking element for clamping a member between the locking element and the free end.

- 10 3. A quick release fastener as set forth in claim 2, wherein the both spring means are formed as coil springs.

- 15 4. A quick release fastener as set forth in any one of the preceding claims including a plunger carried in the body and movable co-axially with the pin, the plunger project-

ing into the chamber for engaging the piston and projecting externally of the body for manual actuation to exert a force on the piston to move the pin to the unlocked position. 20

5. A quick release fastening system comprising a plurality of the quick release fasteners claimed in any one of the preceding claims and a conduit interconnecting the chambers of the fasteners whereby the pins of the fasteners may be simultaneously moved to the unlocked position. 25 30

6. A quick release fastener substantially as described with reference to and as illustrated in the accompanying drawing.

For and on behalf of
AERPAT AKTIEN GESELLSCHAFT,
Hugo Spuhler, Member of
the Board of Management.

